UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
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FEB 24 1998

REPLY TO THE ATTENTION OF:
SR-6J

Mr. Mike Czeczale, Acting Chief
Division of Emergency and Remedial Response (DERR)
Ohio EPA
1800 WaterMark Drive
P.O. Box 1049
Columbus, Ohio 43266

Dear Mr. Czeczale:

The United States Environmental Protection agency (U.S. EPA) has received the Five-Year Review report, developed by the Northeast District Office for the New Lyme Landfill Superfund site. After evaluating the Five-Year Review, the U.S. EPA concurs with its contents and recommendations. The Ohio Environmental Protection Agency effort and cooperation in developing this report are appreciated.

Sincerely yours,

William E. Muno, Director
Superfund Division

Enclosure

cc: Vicki Deppisch, OEPA
Ted Smith, EPA
Jeff Cahn, EPA

New Lyme Landfill
Five-Year Review

SR 11 on Dodgeville Road
New Lyme, Ohio 44066
Ashtabula County

Federal Site Identification Number
OHD 980 794 614

Prepared by:
Ohio Environmental Protection Agency
Northeast District Office
Division of Emergency and Remedial Response
2110 East Aurora Road
Twinsburg, Ohio 44087

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NEW LYME, OHIO
ASHTABULA COUNTY

I. INTRODUCTION

A. Purpose

Pursuant to CERCLA Section 104(d)(1), the Ohio Environmental Protection Agency (Ohio EPA) has conducted a Five-Year Review for the United States Environmental Protection Agency (U.S. EPA) at the New Lyme Landfill Site, Ashtabula, Ohio. The purpose of the Five-Year Review is to ensure that the remedial action implemented at the New Lyme Landfill Site remains protective of public health and the environment and is functioning as designed.

Section 121(c) of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), 42. U.S.C. 9601 et seq, as amended by the Superfund Amendments and Reauthorization Act of October 1986 (SARA), Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substance Contingency Plan (NCP) require that periodic (no less often than five years) reviews are to be conducted for sites where hazardous substance, pollutants, or contaminants remain at the site after remedial actions. Included in the Five-Year Review is a statutory Review of any site at which a post-SARA remedy, upon attainment of the Record of Decision (ROD) cleanup levels, will not allow unlimited use and unrestricted exposure; and a Policy Review of (1) sites where no hazardous substances will remain above levels that allow unlimited use and unrestricted exposure after completion of the remedial action, but the cleanup levels specified in the ROD will require five or more years to attain and (2) sites addressed pre-SARA at which the remedy, upon attainment of the ROD cleanup levels, will not allow unlimited use and unrestricted exposure. OSWER Directives 9355.7-02 (Structures and Components of Five-Year Reviews, May 23, 1991), and 9355.7-02A (Supplemental Five-Year Review Guidance, July 26, 1994) detailed the requirements for the Five-Year Review. The Site is pre-SARA and the Five-Year Review was conducted as a matter of policy.

U.S. EPA has developed a three tier approach for conducting Five-Year Reviews. The three types of five-year Review stress an analysis of the protectiveness of the remedy. U.S. EPA determines the level of review based on site-specific considerations, including the nature of the response action, the status of on-site response activities, and the proximity to populated areas and sensitive environmental areas, determine the

level of review for a given site. A level I is the most basic type of evaluation of protectiveness and is appropriate for most sites. A level II is appropriate if warranted by site specific conditions such as monitoring information to suggest that there was an absence of an expected change in the level of contaminants and contemplates a recalculation of risk, if site-specific circumstances warrant. A level II review might suggest additional source control or migration system sampling or limited evaluation of remedial components. A level III review involves a new risk assessment and is utilized when site specific circumstances show it to be necessary.

A level II review was conducted at the New Lyme Landfill which consisted of level I and level II items as specified in the "5-YEAR REVIEW LEVEL-OF-EFFORT MATRIX" which included a review of various documents, a site visit, standards of Applicable or Relevant and Appropriate Requirements Review (ARARs), and collection of additional data.

B. Site History

The New Lyme Landfill is about 1 mile west of State Route 11 on Dodgeville Road in Ashtabula County approximately midway between the cities of Warren and Ashtabula. The site is about three miles east of Dodgeville and about 1.5 miles west of the intersection of Dodgeville and Hunter Roads (Figures 1 & 2). The landfill is irregular in shape and occupies about 40 acres of the approximately 100-acre tract. On the north, it is bounded by Dodgeville Road and a wooded wetland area associated with Lebanon Creek. Wooded wetland areas also form the west and south boundaries; directly west of the site is a lake. East of the site, land has been cleared for agricultural use.

The New Lyme Landfill received household, industrial, commercial and institutional wastes as well as construction and demolition debris between 1969 and 1978. Initially managed by two area farmers, the landfill was licensed by the State of Ohio in 1971 and operations were taken over by a licensed landfill operator. There were numerous violations of the license, the Ohio Revised Code, and the Ohio Administrative Code. In early August 1978, the landfill was closed by the Ashtabula County Health Department because of numerous violations including open dumping, improper spreading and compacting of waste, failure to obtain state approval for disposal of certain industrial wastes, and reported excavation of trenches into the shale bedrock.

According to Ohio EPA documentation, an average 5,500 cubic yards of domestic wastes, 8,000 cubic yards of commercial wastes, and 14,000 cubic yards of industrial wastes per month were disposed of at the landfill. Documents indicated that wastes at the New Lyme site included: coal tar and coal tar distillates, asbestos, resins and resin tar, paint and paint sludge, miscellaneous oils,

lacquer thinner, peroxide, various corrosive liquids, acetone, xylene, toluene, kerosene, naptha, benzene, trichloroethene (TCE), linseed oil, mineral oil, fuel oil, miscellaneous chlorinated solvents, 2,4-D, laboratory chemicals, and wastewaters.

A Remedial Investigation (RI) was conducted from August 1983 to August 1984 by CH2M Hill for U.S. EPA's Remedial Planning/Field Investigation Team (REM/FIT). Based primarily on information obtained during this investigation, Donohue & Associates, Inc. modeled the ground water flow at the site using a two-dimensional, nonsteady-state ground water flow model called PLASMER 4, which is a modified version of the Prickett-Lonnquist Aquifer Simulation Model known as PLASM (Prickett, 1971). As described on GW-11 of the 1987 Design Analysis, this model can simulate flow in a confined/unconfined, homogenous/heterogeneous, isotropic/anisotropic aquifer system.

Based on the modeling results, Donohue designed a dewatering and treatment system that included thirteen extraction wells and eighteen clusters of monitoring wells (Figure 3). The extraction well network was designed to lower the water table to a depth of at least twenty feet throughout the site within six years of initiation of pumping. Installation of the wells was completed in mid-1989, and pumping and water treatment began in late 1990.

As stated in the 1986 Predesign Report (pages 2-4), the dewatering and treatment system installed at New Lyme Landfill in the late 1980's was intended to:

- lower the water table to a level twenty feet below ground surface;
- control ground water flux into the site;
- control off-site migration of contaminants dissolved in ground water;
- stabilize the residual contaminants (in the soil);
- extract contaminants dissolved on ground water.

Since the system came on-line on October 3, 1990, Sevenson Environmental Services, Inc., Niagara Falls, NY, has conducted the Operation and Maintenance (O&M) tasks.

On July 1, 1994, the State of Ohio assumed the O&M responsibilities of the site. Sevenson Environmental was contracted by the State of Ohio to continue the O&M activities.

1. Nature and Extent of Contamination

Remedial investigation activities conducted from 1983-84 included magnetometer surveys and collection of on-site samples for chemical analysis of surface and subsurface soil, Lebanon Creek sediment and water, ground water, and leachate seeps. Data from

these chemical analyses are included in Table 1 and sample locations are shown in Figures 4, 5, and 6. The data indicate that ground water contamination is related primarily to volatile organic compounds (1,2-dichloroethane, methylene chloride, 2-butanone, 2-hexanone, 4-methyl-2-pentanone, etc.); these constituents are present at levels ranging from 4 ug/L (micrograms per liter) to 76,000 ug/L. Leachate contaminants were primarily volatile organics and semivolatiles. The leachate contaminant levels ranged from 2.6 to 328,000 ug/L. Contaminants were also detected in soil, surface water, and sediment samples. In addition, Polyclorinated Biphenyls (PCBs) and Mercury were detected in soil samples.

2. Hydrogeology

New Lyme Landfill is underlain by glacial till (probably the Hiram or the Lavery till, both Wisconsinan in age) that extends to depths varying from approximately 20 to 40 feet. Boring logs indicate that in the eastern two-thirds of the site, there is a distinct qualitative difference between the upper approximately fifteen feet of till (which is a stiff, dry clayey silt) and the under lying till, which is described in many logs as a dense gray sand, loosely packed and saturated. The sandy till may be assigned to the Titusville till, the basal Wisconsinan unit in Ashtabula County.

The uppermost bedrock at the site consists of the Chagrin Member of the Devonian Ohio Shale Formation. This formation extends to depths in excess of 2,200 feet in the region. At New Lyme Landfill, the shale is gray and is extensively weathered and fractured, both vertically and horizontally.

According to the hydrogeologic investigation, the site lies entirely within the watershed of Lebanon Creek, which flows from east to west along the northern boundary of the site. However, the area to the west and south of the landfill consists primarily of wetlands, and it is difficult to pinpoint the location of the drainage divide between the northerly Lebanon Creek watershed and the southerly Mosquito Creek watershed.

Ground water at the site occurs primarily in the weathered and fractured zone at the surface of the bedrock, as well as in the 10-20 foot thick zone of dense gray sand that overlies bedrock throughout much of the site. Ground water apparently enters the bedrock at some unknown location east of the site and proceeds under artesian head to discharge in the wetlands areas surrounding the landfill. Before pumping started, in the eastern half of the site, water levels in monitoring wells were above the ground surface and occasionally overflowed, especially during the wetter seasons. The 10-15 foot thick layer of clay that forms the uppermost geologic unit in the area appears to act as a confining layer, and the sand unit underlying it throughout much

of the site is generally interconnected with the shale bedrock. It is likely that breaching of the clay unit by the landfill operations, as well as fractures in the till, allowed the confined ground water to move up from the bedrock/sand units through the till and into the more porous landfill, and then drain out the sides of the original mound as leachate. A schematic cross-section of this hydrogeologic system, completed by CH2M Hill for its Predesign Report, is included as Figure 7.

3. Pump and Treat System/Wastewater Treatment Plant (WWTP)

The Record of Decision (ROD) specified that groundwater or leachate be treated in compliance with the substantive requirements of the Clean Water Act prior to discharge to Lebanon Creek.

The Remedial Design (RD) was initiated through the execution of an Interagency Agreement (IAG) between the U.S. EPA and the U.S. Army Corp of Engineers (U.S. ACE) in May 1986. The IAG with the U.S. ACE was later amended to include the Remedial Action (RA) in April 1988. The RA construction contract was awarded to Sevenson Environmental Services (SES) in September 1988, with site construction activities commencing in December 1988. Part of the RA activities included the construction of a wastewater treatment plant (WWTP), as well as a groundwater extraction system, consisting of thirteen extraction wells located around the perimeter of the landfill area. Construction of a leachate collection system began in September 1989 and was completed in December 1989. The system was originally designed as a french drain system that collected wastewater in manholes around the site perimeter. The manholes would be manually pumped and the leachate transferred to the WWTP for treatment on an “as need basis.” This leachate collection system was modified in June 1993, to allow for the leachate to be pumped directly to the WWTP, therefore eliminating the need for manual pumping and the potential for spills.

The final RA activities were completed in early October 1990 when the WWTP and the extraction system went on-line and began treating contaminated groundwater from beneath the landfill area. The pump and treat system continued to operate throughout the remainder of 1990 and 1991, without any major problems or interruptions in either groundwater extraction or treatment.

In 1992, the WWTP and extraction systems started showing signs of iron bacteria bio-fouling. Bio-fouling was a significant problem until June of 1993, when the U.S. ACE contracted with Alford Rogers Columnar Concepts, Inc. (ARC) to clean the extraction wells at the site. ARC utilized a blended chemical heat treatment process to clean and ultimately improve the extraction well performance. ARC provided the U.S. ACE with a preventive maintenance schedule (PM) for each of the thirteen extraction

wells on site. The PM program is an on-going operation and maintenance (O&M) item for those extraction wells affected by bio-fouling. Since implementation of the PM program at the New Lyme site, no significant problems with extraction well bio-fouling have been observed.

Ohio EPA assumed O&M from the U.S. EPA for the WWTP in July 1994, while U.S. EPA maintained responsibility for the extraction system and the associated PM program. In August 1994, a section of the black iron piping in extraction well #5 connecting the stainless steel extraction well to the high density polyethylene (HDPE) main header feed system to the WWTP ruptured due to corrosion of two dissimiliar metals. This caused a complete shutdown of the treatment plant and extraction system. Following several months of negotiations with U.S. EPA concerning this issue, Ohio EPA in the best interest of human health and the environment pursued and obtained state funding for the project. To eliminate the potential for rupture of other extraction well piping, the Ohio EPA decided to replace all the black iron piping with stainless steel in the remaining extraction wells. Additionally, each extraction well was fitted with a valve capable of isolating each individual well from the header system. These isolation devices eliminate the need to shut down the system in the future should additional work need to be completed on individual wells in the system. The repairs began in December 1994 and were completed in February 1995. The extraction system and the WWTP went back on-line in March 1995 and have been operational since that time.

In May 1996, Ohio EPA, following a review of WWTP influent and effluent data, discontinued use of several treatment unit processes which included the metals precipitation process, including pH adjustment and the rotating biological contactors (RBC’s) and their related nutrient feed system. There were no indications from influent analytical data, which may have been due to dilution, that any significant metals or organics were part of the influent groundwater to the WWTP. Therefore, unit processes designed to deal with these contaminants were no longer needed. The nutrient feed system for the RBC units was actually degrading the water quality by adding such metals as zinc to the effluent stream.

Currently, the WWTP operational units include a tertiary sand filter treatment and two ten thousand gallon Granular Activated Carbon (GAC) units. To date, there appears to be no problems with the treatment train modification. The plant continues to treat influent groundwater as it was designed.

4. Wastewater Discharge Limits

In accordance with CERCLA 121(e) and OAC 3745-33-02(C), a NPDES permit was not required for the New Lyme site. Water quality

based effluent limits for the New Lyme landfill were developed by the Division of Water Quality, Ohio EPA, central office, in December 1987. Wasteload allocation modeling procedures were applied utilizing Ohio Water Quality Standards. Appendix A provides historical and current information related to the water quality standards.

Limits were determined for various metals and organic parameters for the wastewater treatment plant at the New Lyme Landfill. The limits were calculated to maintain the Chronic Criteria (CC) using $Q_{30,10}$ as the stream design flow for the 30 day average limit and to maintain the Acute Aquatic Criteria (AAC) using $Q_{7,10}$ for the daily maximum limit. In addition, the results were compared and limited to the Final Acute Values (FAV) as absolute maximums. That model input data is detailed in tables generated as part of this process.

5. WWTP Process

The WWTP was designed to pump the influent wastewater from the collection wells to the equalization tank. The wastewater, with the addition of polymer (flocculant) and sodam (precipitant), flows by gravity to the primary clarifier where the heavy metals precipitate at a pH of approximately 9 to 10. This process was initially used at the site but is not currently in use due to the lack of detectable incoming heavy metals. The solids generated from the primary clarifier are then pumped to the gravity thickener. Following the metals precipitation step, the wastewater is pH adjusted (7.0) with the addition of sulfuric acid, prior to entering the rotating biological contactors (RBCs). This process is also not currently part of the process because of the elimination of treating heavy metals.

The RBCs are fixed microbial media where aerobic degradation is used to remove organic constituents in the effluent. There are three RBC units in the WWTP which can either be run in series or parallel configuration. The RBCs are set to operate in series at the New Lyme site. The RBCs are not used at the site at this time due to low organic content.

The wastewater flows by gravity to the RBC effluent tank. The solids generated from the biological clarifier are then pumped to the gravity thickener. Flow from the biological clarifiers is equally divided between two sand filters in parallel. The sand filters are used to remove remaining suspended solids.

From the sand filters, the wastewater is pumped to the granular activated carbon columns (GACs) where the remaining organic matter are removed by means of absorption. The carbon columns can be run in series or parallel. The columns currently operate in series at the plant. Following sampling collection, the effluent is discharged to a holding pond prior to release to the

creek.

The gravity thickener accepts sludges from both the primary and biological clarifiers. The solids portion settles to the bottom of the tank while the clear supernatant flows to the recycled tank. The sludge is pumped from the gravity thickener to the flash mix tank where a lime slurry is added. The lime slurry is added to assist in dewatering and also preventing the sludge cake from adhering to the filter press plates.

Following the lime conditioning step, the sludge is then pumped to the plate and frame filter press. The filter press is designed to achieve maximum dewatering of the sludge. The filtrate, generated as part of the dewatering process, drains by gravity to the recycle tank for additional treatment. The dewatered sludge is then discharged from the bottom of the filter press to a sludge hopper located on the main floor. The filter press generates approximately 1,200 pounds of sludge per cycle. The sludge hopper is an approved roll-off box that is properly lined for hazardous sludge. The sludge remains in the roll-off onsite until the sampling and analytical results determine the proper disposal.

6. Ground Water Monitoring System

Based on the modeling results interpreted by Donohue, thirteen extraction wells and eighteen clusters of monitoring wells (Figure 3) were installed at the site. Installation of the wells began in June 1989 and was completed in October 1989. Quarterly monitoring well sampling and analysis began in October 1990. From October 1990 through September 1993 the monitoring wells continued to be sampled.

Landfill subsidence problems necessitated the replacement of the monitoring wells. The U.S. Army Corps of Engineers contracted Sevenson Environmental Services for the abandonment and replacement of the wells between November 1993 and May 1994. No ground water monitoring wells were sampled during this time. The ground water sampling and analysis resumed in May 1994 after the installation of the new replacement wells.

The current ground water monitoring system at the site consists of 36 monitoring wells on-site, 8 monitoring wells off-site, 15 piezometers used for water level measurements, and 13 extraction wells (Figure 8). An additional 12 piezometers have recently been installed in the waste to obtain information for the Five-Year Review and will be discussed in further detail later in this report.

The monitoring wells were originally designated to be sampled on a quarterly basis and were sampled until May 1996. In May 1996, Ohio EPA reduced that frequency of sampling to twice a year. The

basis for reduced sampling was because of the unexpected low levels of or absence of contaminants above detection limits from the initial field investigation work performed in 1983 and 1984.

In accordance with “Final Design Submittal (95%) Hazardous Waste Cleanup, New Lyme Landfill Superfund Site, Ashtabula, County, Ohio, Site-Specific Quality Management, Plan, Site-Specific Safety Plan,” November 1987, one monitoring well from each well cluster was sampled on a random basis. In October 1996, Ohio EPA began sampling all monitoring wells (on and off-site). All available ground water analytical data is included in this review in Appendix B. (Not all data for all parameters could be located to include in this review.)

Ground water flow is predominantly to the west in the shallow and intermediate zones and to the south/southwest in the deeper bedrock.

7. Residential Wells

The potable water source in the area is ground water. The Remedial Investigation (1986) states that domestic well water samples were collected from 10 residences within 1/2 mile of the site during March and April, 1984 (Figure 6). All samples were collected from faucets. Water softeners or other treatments were not in use during the sampling event. Prior to collection, each system was purged for a minimum of 5 minutes. The analytical results and locations are shown in Figure 9. Sample D06 had constituents detected above the detection limit as shown in Figure 9. This well appears to be upgradient of the landfill and, therefore, the constituents detected during the RI in sample D06 cannot be explained. Two other wells, D01 and D11 had low levels of phthalate detected in the water.

Six residential wells located side and downgradient of the site(including the WWTP well) are sampled on a yearly basis since the Ohio EPA assumed O&M responsibilities. No contaminants have been detected in these wells.

In additional to the six yearly sampled residential wells, several other residential wells were sampled in December 1996 and November 1997 which included D06. Bis(2-ethylhexyl)phthalate was detected in well D06 at a concentration of 20 ug/L. According to the property owner, the water from this well is not used for a potable water supply. A confirmation sample was analyzed in November 1997 for well D06 to confirm the presence of this contaminant. All analytical results were below detection limits. No contaminants were detected in any other sampled well (Figure 6 and Table 2).

8. Extraction Wells

Thirteen extraction wells were installed at the site and began pumping on October 3, 1990. The extraction wells were individually sampled and analyzed on 5/22/91, 3/19/96 and 10/16/96. Data indicate (Appendix C) the highest concentration of contaminants were detected in extraction well 1 on 5/22/97 while some contaminants were detected in some of the wells on various dates at lower levels. Many constituents in the remaining wells were either below the detection limits or detected at lower concentrations.

9. Influent/Effluent Data

Influent and effluent data were analyzed beginning in October 1990. Not all parameters analyzed in the effluent were initially analyzed in the influent. With the March 5, 1992 data, the same parameters were analyzed for the influent and effluent. The parameters analyzed for the influent had concentrations higher than the discharge limits for ammonia Nitrogen as N, CBOD, suspended solids, and zinc. Discharge exceedances for the effluent include ammonia Nitrogen as N, Copper, and CBOD. Influent and effluent data is tabulated and summarized in Appendix D. Data gaps between August 1994 and February 1995 reflect the time the system was down.

II. ADDITIONAL DATA FOR THE FIVE-YEAR REVIEW

As part of the Five-Year Review, Level II approach, additional data were collected to help assess the remedial action at the New Lyme site. The U.S. EPA initiated the Five-Year Review investigation in August 1995, by issuing a Statement of Work which outlined the additional data requirements for the Five-Year Review. A copy of the Scope of Work is presented in Appendix E. The New Lyme Defense Group (PRPs) agreed to fund and perform some of the additional field work at the site. The New Lyme Defense Group retained Eckenfelder Inc. to perform these tasks.

A. Additional Data Collected by PRPs Through Eckenfelder Inc.

Task 1 of the Scope of Work was completed in April, 1996 with the approval of the Work Plan titled “Five-Year Remedy Review Investigation Work Plan, New Lyme Superfund Site” by Eckenfelder Inc. dated April 1996. Field work was conducted during the spring and summer of 1996. The following is a summary of the additional work performed by Eckenfelder Inc. at the site:

1. Aerial photos were reviewed between 1958 through 1991 to provide information on operational practices and waste trench orientation. The photos as interpreted by Eckenfelder Inc. were

inconclusive. The aerial photos were not included in the report for U.S. EPA and Ohio EPA review, but are referenced.

2. Geophysics methods were used to identify the location and orientation of the landfill trenches. Terrain conductivity (electromagnetic) was selected over a variety of other geophysical methods to provide the best resolution. The geophysical survey was conducted using a Geonics Limited EM-34-3 Terrain Conductivity Meter. This method resulted in an effective exploration depth of 24.6 feet (horizontal dipole mode) and 49.2 feet(vertical dipole mode). Recording both the vertical and horizontal dipole readings addressed potential changes related to conductivity of the waste versus glacial till and the presence of near vertical trench walls.

Data interpretation in the northern most part of the landfill by Eckenfelder Inc. suggests a single, long, east-west oriented trench or trenches containing saturated waste, or a series of shorter, closely spaced, northwest-southeast trending trenches which are not clearly separated in this vicinity. These data further suggest that there may be large areas of saturated waste throughout the central portions of the landfill. Other less conductive trenches are suggested in a north-south orientation to the east and west.

The results of the geophysical survey were used by Eckenfelder Inc. to select locations for the piezometers to be installed in the waste. Three of the originally selected locations did not encounter waste. Eckenfelder Inc. concluded the geophysical data, although it may be useful for evaluating the general configuration of the former landfill trenches, may not be able to accurately locate individual trenches. The Agencies agree.

3. On the basis of the geophysical results, fourteen locations within the landfill were selected for the installation of piezometers and twelve were installed. The objective of the installation of the piezometers was to measure leachate levels within the landfill waste and compare them to water levels in monitoring wells, extraction wells, and piezometers immediately adjacent to the waste. The water levels were measured with the pump and treat system operational. Water level elevations are shown in Table 3 and Figure 10 interprets the difference between the monitoring wells/extraction wells/piezometers water level measurements and the water levels in the waste piezometers. As shown in figure 10, leachate levels in the waste range from 0 to >10 feet.

Boring logs for the piezometers included in “Five Year Remedy Review Investigation, Hydrogeologic Report, New Lyme Landfill” by Eckenfelder (December 1996) indicate the waste is not in bedrock as historically suggested.

4. Slug tests were conducted in each newly installed piezometer. The values ranged between 6.75 X 10-2 cm/sec to 1.9 X 10-3 cm/sec. Some of the piezometers did not have sufficient well volume to conduct the test. In others the data was so sporadic it could not be analyzed. Many of the locations exhibited the effect of delayed sand pack drainage. As stated by Eckenfelder Inc., "due to the heterogeneity of the waste, the data were inconclusive and the values should be viewed with caution."

Review by U.S. EPA and Ohio EPA concluded that slug tests in the waste are not representative of the aquifer characteristics and therefore the values cannot be accepted.

5. A composite leachate sample was collected and analyzed from the piezometers installed in the waste (Appendix F). The data are to be used for alternative treatment evaluations.

6. Flow maps were generated from the static water level measurements with the pump and treat system operating.

7. All ground water data were re-evaluated.

8. A numerical ground water flow model was constructed for the site to achieve two objectives: (1) The model was constructed to test the conceptual model of hydrogeologic conditions at the site. The model was submitted to integrate the hydrogeologic properties of each of the geologic formations and maintain a balanced water budget throughout the system. The objective is to identify inconsistencies in the conceptual model and provide a means of evaluating appropriate modifications. Modeling was used to define to what extent the vertical permeability of the underlying till controls the dewatering of the waste within the landfill. (2) The second objective of the model was to assess future alternative remedial actions. A contaminant transport model was also run for the site. Visual Modflow, MT3D and Bioscreen were the model and contaminant transport model presented for the site. The model is currently under review.

B. Additional Data Collected By U.S. EPA and Ohio EPA

As the above tasks were completed, additional supportive tasks and data gaps were identified that would assist in the interpretation of the additional data that was collected for the Five-Year Review by Eckenfelder Inc. The following are the additional tasks:

1. The pump and treat system was turned off and static water levels were measured in all wells (monitoring wells, piezometers, piezometers in waste, and extraction wells) until the wells equilibrated. The pump and treat system was turned off on February 2, 1997. Static water levels were recorded prior to

turn off on January 31, 1997. Beginning February 3, 1997, all static water levels for all wells were recorded. The static water levels are presented in Table 4. The pump and treat system resumed operations after the April 4, 1997 static water levels were measured. The May 7, 1997 measurement reflects the static water levels of all wells with the pump and treat system operational. The purpose of equalibrating the wells was to record the static water levels as the wells recovered and determine possible interconnections of the waste piezometers with the glacial material immediately beneath and next to the waste.

Piezometer P-2 showed the greatest water level recovery with greater than 10 feet. Piezometer P-10A had a four foot recovery. Other piezometers had minor water level fluctuations while others remained relatively stationary.

2. Flow maps were generated using the April 4, 1997 static water levels for all on-site monitoring wells. This includes the shallow zone (30 foot depth), the intermediate zone (45 foot depth), and the deep zone (90 foot depth). Figures 11 and 12 show water levels for the shallow and intermediate zones. Based on the available data, water flows predominately from east to west across the site. Water levels for the deep zone (Figure 13) show flow occurring from northeast to south/southwest although deep wells have not been installed equally around the site. The shallow wells are screened in the glacial till, the intermediate wells are screened in the glacial till/bedrock interface, and the deep wells are screened in shale bedrock. Some shallow and intermediate water level measurements are approximately the same indicating an interconnection between the till and the till/bedrock interface.

3. Although a composite leachate sample was collected from the waste piezometers by Eckenfelder Inc., individual sampling of each piezometer was necessary to further characterize the waste at that particular location. Piezometers P-2, P-11A, and P-14 were sampled on June 3, 1997 for full scans and Piezometers P-1, P-3, P-4, P-5, P-6, P-9 and P-13 were sampled on August 3, 1997 for volatile organics only. Piezometers P-7 and P-10A were dry and were not sampled. The analytical results are presented in Appendix G. As shown in Appendix G, high levels of contaminants were detected in some areas.

4. The monitoring wells were sampled and analyzed as scheduled while the pump and treat system was still turned off.

III. DISCUSSION OF REMEDIAL OBJECTIVES

A Record of Decision, Remedial Alternative Selection was signed on September 27, 1985 by the U.S. EPA (Appendix H). Consistent With the Comprehensive Environmental Response, Compensation and

Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), it was determined that taking source control action by capping the landfill and consolidating contaminated sediment under the cap, and taking management of migration action by extraction and onsite treatment of contaminated leachate and ground water at the New Lyme site was a cost-effective remedy that provides adequate protection of public health, welfare and the environment. The State of Ohio was given an opportunity to review and comment and concurred with the approved remedy. In addition, the action required further operation and maintenance activities to ensure the continued effectiveness of the remedy. It was also determined that the action taken was appropriate when balanced against the availability of Trust Fund monies for use at other sites.

Specifically, the description of the selected remedy included:

- Installation of RCRA cap over landfill.

- Extraction/containment wells around perimeter of landfill to dewater the landfill and eliminate leachate production. Wells must operate indefinitely to maintain effectiveness of remedy.

- Onsite treatment of contaminated ground water and leachate using biological disc, sodium hydroxide precipitation, and granular activated carbon until leachate is no longer produced and treatment becomes unnecessary (after about 15 years).

- Onsite consolidation of contaminated sediment.

- Gas control, fence, ground water monitoring.

The onsite WWTP is expected to treat contaminated ground water and leachate until the contaminated leachate is no longer produced and wastewater treatment becomes unnecessary. This process is expected to last for a period of approximately fifteen years. The extraction wells will continue to operate with the express purpose of maintaining and sustaining the hydraulic barrier between the landfill area and the surrounding ground water. The ground water will then bypass the WWTP without the necessity for treatment and be directly discharged to Lebanon Creek.

A. Summary

1. RCRA Cap

The RCRA cap has prevented surface water infiltration where it has been installed and has contributed to eliminating the problematic leachate seeps. This has been consistent with the goal of the Record of Decision (ROD). The cap was not designed to address the areas of ground water recharge off-site and does not prevent ground water migration into the site.

Piezometers were installed through the cap and into the waste for additional investigative data for the Five-Year Review. Additional low permeable material was placed around the waste piezometers which had experienced subsidence problems during the collection of the additional data for the Five-Year Review.

The cap is inspected and maintained on a regular basis by Sevenson Environmental.

2. Ground Water Monitoring System

The analytical ground water monitoring data (Appendix B) indicate that ground water contamination is generally lower than initial investigation samples collected in 1983 and 1984. However, analytical data indicate contaminants (with qualifiers as noted it Appendix B) were detected in the three off-site monitoring well clusters (well series 20, 21, and 22). The Hunter Road wells (series 22) are to the east of the and appear to be upgradient of the site. Well series 20 and 21 are in the general downgradient direction and are to the northwest and the southwest, respectively.

During the time period that the pump and treat system was not operating and the static water levels in all the wells were recovering, the following was noted:

a. The relationship between the waste and the glacial till is known only at the location of the 12 waste piezometers. Waste piezometers P-2, P-7, P-10A, P-13, and P-14 had increased water/leachate levels indicating an interconnection with the more permeable glacial material. Piezometer P-2 had the highest recovery rate of approximately 11 feet. The boring logs for the waste piezometers indicate the waste is next to the glacial material and not the bedrock shale. In addition, the monitoring well boring logs indicate that the glacial till at the site is heterogenous and thus the permeability and the glacial material (silt, sand, etc.) varies across the site.

Conversely, the remaining waste piezometers which showed no fluctuations indicate low permeable material between the waste and the glacial material. This may have affected the ability of

the extraction wells to dewater the waste cells.

b. Twelve monitoring wells (shallow and intermediate) and seven piezometers (intermediate depth) reached artesian conditions to the top of the casing during the time the pump and treat system was turned off. Many other wells, including the bedrock wells, recovered relatively close to the surface elevation and when compared to depths of waste from the waste piezometers it indicates the ground water is above the bottom depth of the waste.

c. Many shallow and intermediate wells' static water levels were approximately the same elevation (April 4, 1997 data), indicating the two zones are interconnected. Further, the intermediate wells are screened at the bedrock/till interface where the shale is highly fractured and may provide a conduit for contaminant migration to the fractured bedrock.

Until recently, not all ground water monitoring wells were sampled and analyzed. One well was chosen randomly from each well cluster and therefore, historical trend data are not available for each well.

3. Leachate

In order to further characterize the waste in the landfill, leachate samples were collected from the waste piezometers. Eckenfelder Inc. collected a composite sample of leachate in 1996. Subsequently, in 1997, U.S. EPA and Ohio EPA collected samples for a full scan from piezometers P-2, P-11A, and P-14. Samples were collected for a volatile organics scan only from piezometers P-1, P-3, P-4, P-5, P-6, P-9, and P-13. Piezometers P-7 and P-10A were dry and could not be sampled. Many piezometers had low concentrations of contaminants but some had detectable reported values in the millions (ug/L). High levels of contaminants were detected in piezometer P-14 which also showed about one foot fluctuation during the static water equilibration period. Detection limits were high for some of the piezometers; contaminants may be there but below the detection limit. Leachate analytical data are included in Appendix G.

Leachate seeps have not been observed emanating from the landfill since the pump and treat system and the cap have been installed.

4. Influent/Effluent

As stated previously, some discharge limit exceedances occurred in the effluent and some parameters in the influent were higher than the discharge limit and therefore, required treatment. Many constituents in the influent and effluent were not detected or detected at low levels.

5. Residential Wells

Ground water is the potable source in the area. Most of the residential wells in the vicinity of the site are installed in the shale bedrock. No contaminants have been detected in residentials wells that have been sampled since the RI with the exception of D06. Residental well D06 had detected contaminant(s) during the RI and the December 1996 sampling event. Since well D-06 appears to be upgradient of the site, the relationship between well D-06 and the landfill is unclear.

6. WWTP

The WWTP is currently operational. Several modifications have been made to the system: (1) no chemical addition is added for heavy metal precipitation, (2) the RBCs are not in operation due to low organic content, and (3) no pH adjustment is needed since the RBCs are not in operation. All other processes are operating as designed.

7. Gas Vents

Gas vents were installed with the construction of the RCRA cap to prevent methane gas migration. The passive system appears to be operating correctly.

8. Extraction Wells/Pump and Treat System

Analytical data from the monitoring wells indicate low levels of contamination.

The pump and treat system was designed to pump 100 gpm. The average pumping range is between 75 and 100 gpm depending on water level elevations. The pump and treat system has lowered the water table and consequently, some leachate levels where the more permeable glacial till is interconnected with the waste. It has reversed artesian conditions (only when it is operating) and is also likely to have contributed to eliminating the leachate seeps. The pump and treat system has not dewatered the landfill at the rate originally anticipated in the Record of Decision (ROD)probably due to the heterogeneity of the glacial till.

9. Ground Water Model

As part of the RD/RA process, a ground water model was used to design the pump and treat system. The data, that is available for purposes of this review, is insufficient to evaluate the adequacy of the ground water model which was used to design the pump and treat system. Modeling has become sophisticated since the mid-eighties when the RD/RA model was used to design the pump and treat system and more appropriate models are available today to

evaluate this site.

As part of the Scope of Work for the Five-Year Review, Eckenfelder, Inc. submitted a ground water model and contaminant transport model (Visual Modflow, MT3D, Bioscreen) to be reviewed by U.S. EPA and Ohio EPA.

Although the model submitted is an indicator of site conditions and is typically used to predict present and future conditions, it is not a decisive factor for recommendations for this Five-Year Review. The Review is based on available, site-specific data.

B. Record of Decision Objectives

1. The RCRA cap and gas vents are operational and have met the objectives of the ROD. The cap has minimized surface water infiltration, and consequently reduced leachate seeps, where it is installed.

2. Data collected for the Five-Year Review indicate some piezometers installed in the waste are interconnected with the glacial till material under the fill. With the pump and treat system operational, leachate levels relative to monitoring wells ranged from 0 to >10 higher than ground water. According to leachate analyses, high levels of contaminants exist at some piezometer locations.

As a containment remedy, the pump and treat system has been protective of human health and the environment. It has lowered the water table, reduced leachate seeps, reversed artesian conditions, and lowered leachate levels where the more permeable glacial till is in contact with the waste. Potable receptors (with the exception of D06) in the area have not had contaminants detected in the water.

The remedy has lowered the water table but has not dewatered the landfill. The heterogeneity of the glacial material and the known phenomenon of landfill mounding has contributed to this lack of performance. The ground water model data used to design the pump and treat system is insufficient to evaluate the adequacy of the system. Once approved, the model generated as part of the Scope of Work for the Five-Year Review by Eckenfelder Inc. may help to evaluate this system.

3. Three processes were eliminated at the WWTP in treating the wastewater prior to discharge which were not anticipated in the ROD. Although many contaminants were detected at low levels or below detection limits in the influent and effluent, there were parameters (ammonia Nitrogen as N, CBOD, suspended solids, and zinc) in the influent that were higher than the discharge limits

and therefore, warranted treatment. The WWTP has processed the wastewater to acceptable discharge limits with some exceptions.

IV. SITE VISIT

Many site visits were conducted during the course of this review by Ohio EPA personnel. Oversight was provided by Ohio EPA during the additional work phase conducted by Eckenfelder, Inc. The general site visits consisted of performing document reviews, updating the status of current conditions and documenting any problems encountered.

V. RISK ASSESSMENT RECALCULATION

A level II Review contemplates recalculation of risk. It is an intermediate type review and is appropriate only if warranted by site-specific circumstances. There are no site-specific circumstances that warrant a recalculation of risk at this time for the New Lyme Landfill.

VI. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS REVIEW (ARARs)

Five-Year Review guidance established policy for U.S. EPA to review and analyze the remedial action at a site as it is affected by newly promulgated or modified Federal and State environmental laws. The remedial action must meet all identified applicable or relevant and appropriate Federal and State requirements. ARARS for the site remedy are as follows:

A. Safe Drinking Water Act (SDWA), 40 CFR Parts 141-143. Establishes Maximum Contamination Levels (MCLs) for ground water remediation.

B. Ohio Revised Code (ORC) 6109 and Ohio Administrative Code (OAC) 3745-81 Drinking Water Standards.

C. ORC 6111 Ohio Water Pollution.

D. OAC 3745-1 Ohio Water Quality Standards.

E. OAC 3745-31 Ohio Air Permits to Install New Sources.

F. OAC 3745-27 Ohio Solid Waste

G. Resource Conservation Recovery Act (RCRA)

H. National Environmental Policy Act (NEPA)

I. Executive Orders for Wetlands

J. Clean Water Act (CWA)

New discharge limits have been calculated for the New Lyme Landfill regarding changes to Ohio Water Quality Standards (Appendix D). The new limits are based on changes in Ohio Water Quality Standards implemented in 1994 as well as the Great Lakes Initiative which became effective on October 31, 1997. Upon receipt of this Five-Year Review, the new discharge limits will be effective.

VII. REMEDY MODIFICATIONS PROPOSED BY PRPs

The PRPs have suggested a remedy modification. If a remedy modification is appropriate, it may be addressed through an Explanation of Significant Difference(ESD)or ROD Amendment issued by U.S. EPA. Any Alternative Remedy must be approved by U.S. EPA and Ohio EPA and must be demonstrated that it is protective of human health and the environment and complies with all applicable ARARs.

VIII. RECOMMENDATIONS

The following are recommendations for the New Lyme site:

A. Implement the new discharge limits reflective of Ohio Water Quality Limits and the Great Lakes Initiative effective October 31, 1997.

B. Sampling of residential wells should be continued on an annual basis (unless data suggest that a well has been or may be impacted) for all parameters. This includes the wells located on Dodgeville Rd (side and downgradient) which are sampled yearly and residential well location D06.

C. Re-evaluate and define rate and extent of off-site ground water contamination. Contaminants have been detected in off-site monitoring wells (with qualifiers) as well as one residential upgradient well. Install additional monitoring wells as needed.

D. Install one downgradient monitoring well cluster (3 wells) immediately to the west offsite and two side gradient monitoring well clusters (3 wells each) offsite.

E. Replace monitoring well MW-20A that was too heavily damaged to use for sampling.

F. Evaluate and install additional bedrock monitoring wells to adequately monitor the entire site. Verify bedrock flow direction.

G. Re-evaluate Sampling and Analysis Plan and QA/QC. Analytical methods should include all known contaminants detected in the leachate/groundwater and detection limits must be below any known MCL and as low as possible for all other contaminants.

H. Continue to maintain and inspect the site and other O&M activities which include, but are not limited to, the cap, gas system, fence, WWTP, etc.

IX. STATEMENT OF PROTECTIVENESS

Overall, the remedy is functioning as anticipated in the ROD and is protective of human health and the environment. The ground water pump and treatment system has successfully reduced the water level in the landfill in certain areas and met other objectives of the ROD. Contaminant levels in the monitoring wells, extraction wells, and influent ground water have been relatively low.

With the exception of residential well (D-06), the residential well data do not show any detectable contamination. Based on available data, the ground water currently appears to be a reliable drinking water source in the area.

X. NEXT REVIEW

The next review will be five years from the date of this review if the remedy remains the same.

Upon a U.S. EPA and Ohio EPA approved alternative remedy modification, the next review will occur five years from the implementation of that change.